

CLAIMS

I claim:

1. A parametric speaker sound emitting device for providing at least one new sonic frequency as a by-product of emitting at least two ultrasonic frequencies from an ultrasonic frequency emitter, comprising:
 - 5 an emitting perimeter of ultrasonic emitting material having an outer radius and an inner radius respectively surrounding an interior open space,
 - 10 wherein a ratio of (i) a difference between the inner radius and the outer radius of the emitting perimeter to (ii) the outer radius of the emitting perimeter is within a numerical range of 0.1 to 1.0.
 2. A device as defined in claim 1, wherein the ratio is within the numerical range of .2 to .4.
 3. A device as defined in claim 1, wherein the emitting perimeter comprises a substantially continuous ring of emitter material.
 - 15 4. A device as defined in claim 1, wherein the emitting perimeter comprises segments of emitter material.
 5. A device as defined in claim 1, wherein the emitting perimeter comprises an array of piezoelectric emitters forming at least one ring of emitting material around the open space.
 - 20 6. A device as defined in claim 1, wherein the emitting perimeter comprises at least one electrostatic membrane.
 7. A device as defined in claim 1, wherein the emitting perimeter includes piezoelectric film material.
 - 25 8. A device as defined in claim 1, wherein the emitting perimeter comprises separated emitter elements which are displaced from adjacent emitter elements along a length of the emitting perimeter, thereby spacing the emitter elements with gaps wherein no ultrasonic emissions are occurring.
 9. A device as defined in claim 8, wherein the gaps are within a range of .2 to 2.0 cm.

10. A device as defined in claim 9, wherein the gaps are within the range of .5 to 1.5 cm.

11. A sound emitting device for providing at least one new sonic frequency as a by-product of emitting at least two ultrasonic frequencies from an ultrasonic frequency emitter, said device comprised of:

5 a plurality of ultrasonic emitting perimeter segments coupled together at adjacent edges and positioned around a central open section, said emitting perimeter having a directional orientation along a transmission axis;

10 an ultrasonic frequency signal source for generating a first ultrasonic signal;

15 a sonic or subsonic frequency generator for supplying an electrical signal corresponding to the at least one new sonic or subsonic frequency;

20 modulating means coupled to the ultrasonic frequency signal source and sonic or subsonic frequency generator for mixing the first ultrasonic frequency signal with the electrical signal corresponding to the at least one new sonic frequency to thereby generate a waveform including the first ultrasonic frequency signal and a second ultrasonic frequency signal;

25 said emitting perimeter comprising ultrasonic frequency emitting material coupled to an output of the modulating means for (i) propagating a waveform embodying both the first and second ultrasonic frequency signals, and (ii) generating the at least one new sonic frequency as a by-product of interaction between the first and second ultrasonic frequency signals.

12. A device as defined in claim 11, wherein at least one of the segments can be decoupled from its adjacent segment and wherein the plurality of segments can be collapsed together to a smaller volume for storage.

25 13. A device as defined in claim 13, wherein the plurality of segments comprise rectangular shapes having one edge which includes a hinge member for coupling to a hinge member of an adjacent segment, said open section forming a rectangular opening.

14. A device as defined in claim 12, wherein the smaller volume of the plurality of segments forms a box shape providing a convenient storage configuration.

15. A method for enhancing efficiency of a parametric speaker sound emitting device for providing at least one new sonic frequency as a by-product of emitting at least two ultrasonic frequencies from an ultrasonic frequency emitter with respect to energy output based upon emitter surface area, said method comprising the steps of:

- 5 a) forming an ultrasonic frequency emitting perimeter around an open region which is substantially void of ultrasonic emitting material; and
- b) emitting ultrasonic frequency from the emitting perimeter to generate sonic or subsonic sound within surrounding air as part of a parametric speaker system.

10 16. A method as defined in claim 15, further comprising the step of forming the emitter material with individual emitter elements positioned along the emitting perimeter and spacing the emitter elements at separated distances from adjacent emitter elements, thereby avoiding closed configuration of the emitter elements and reducing power losses resulting from shock effect of localized emitter energy at an air interface with the emitter elements.